



# Technical Standard Order

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**Subject:** NICKEL-CADMIUM AND LEAD-ACID BATTERIES

- 1. PURPOSE.** This Technical Standard Order (TSO) is for manufacturers of permanently installed rechargeable nickel-cadmium and lead-acid batteries. In it, we (the Federal Aviation Administration, or FAA) tell you what minimum performance standards (MPS) your nickel-cadmium and lead-acid batteries must meet if you apply for a TSO authorization or letter of design approval. The TSO describes the MPS of rechargeable nickel-cadmium and lead-acid batteries to be identified with the applicable TSO marking.
- 2. APPLICABILITY.** The standards of this TSO apply to rechargeable nickel-cadmium and lead-acid batteries for which an application for a TSO authorization is submitted after this TSO's effective date.
- 3. REQUIREMENTS.** New batteries identified and manufactured on or after the effective date of this TSO must meet the standards in RTCA Inc. document RTCA/DO-293, Minimum Operational Performance Standards (MPS) for Nickel-Cadmium and Lead-Acid Batteries, dated July 29, 2004.
  - a. Functionality.** This TSO's standards apply to permanently installed, rechargeable nickel-cadmium and lead-acid batteries intended to provide power for aircraft equipment including emergency and standby systems, and electrical power to start aircraft engines or auxiliary power units when required.
  - b. Environmental Qualification.** Test nickel-cadmium and lead-acid batteries to the conditions specified in RTCA/DO-293. In RTCA/DO-293, replace the information that references RTCA/DO-160D, Environmental Conditions and Test Procedures for Airborne Equipment, dated July 29, 1997, with RTCA/DO-160E, (same title) dated December 9, 2004.
  - c. Deviations.** We have provisions for using alternate or equivalent means of compliance to the criteria in the MPS of this TSO. If you invoke these provisions, you must show that your batteries maintain an equivalent level of safety. Apply for a deviation under Title 14 of the Code of Federal Regulations (14 CFR) § 21.609.
- 4. MARKING.** Mark each nickel-cadmium and lead-acid battery permanently and legibly with all the information in 14 CFR § 21.607(d) and RTCA/DO-293, Section 1.10.

**5. APPLICATION DATA REQUIREMENTS.** Under 14 CFR § 21.605(a), as a manufacturer-applicant you must give the FAA aircraft certification office (ACO) manager responsible for your facilities, one copy each of the following technical data to support FAA design and production approval:

- a. Operating instructions and battery limitations, sufficient to describe the operational capability of the battery in accordance with RTCA/DO-293, paragraph 1.13.3.
- b. Installation procedures and limitations, sufficient to ensure that the battery, when installed in accordance with the installation procedures, still meets the TSO's requirements. The limitations must include a note with the following statement:

The conditions and tests for this TSO approval of this battery are minimum performance standards. Those installing this battery, on or in a specific type or class of aircraft, must determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR part 43 or the applicable airworthiness requirements. Nickel-cadmium and lead-acid battery safety concerns include the possibility of fire, and venting violently.

- c. Schematic drawings of the installation procedures.
- d. Wiring diagrams of the installation procedures.
- e. Specifications.
- f. Instructions for periodic maintenance and calibration necessary for continued airworthiness in accordance with RTCA/DO-293, paragraph 1.15.
- g. An environmental qualification form describing the environmental tests conducted in accordance with RTCA/DO-293.
- h. List of components by part number.
- i. Manufacturer's TSO qualification test report.
- j. Nameplate drawing with the information required by paragraph 4 of this TSO.
- k. A list of all drawings and processes, (including revision level) to define the article's design.

**6. MANUFACTURER DATA REQUIREMENTS.** Besides the data given directly to the FAA, a manufacturer must have the following technical data available for review by the responsible ACO:

- a. The functional qualification specifications for qualifying each production article to ensure compliance with this TSO.

- b. Equipment calibration procedures.
- c. Corrective maintenance procedures within 12 months after TSO authorization.
- d. Schematic drawings.
- e. Wiring diagrams.
- f. The results of qualification tests conducted in accordance with RTCA/DO-293.

**7. FURNISHED DATA REQUIREMENTS.** One copy of the data and information specified in paragraphs **5.a** through **5.g** must go to each person receiving one or more batteries manufactured under this TSO.

**8. HOW TO GET REFERENCED DOCUMENTS.**

- a. Order copies of RTCA documents DO-293 and DO-160E from RTCA Inc., 1828 L Street NW, Suite 805, Washington DC 20036-4001. You can also order them online at [www.rtca.org](http://www.rtca.org).
- b. Order copies of 14 CFR part 21, Subpart O, from: the Superintendent of Documents, Government Printing Office, P.O. Box 37154, Pittsburgh PA 15250-7954. You can also get copies from the Government Printing Office website at [www.access.gpo.gov](http://www.access.gpo.gov). Select "Access," then "Online Bookstore." Select "Aviation," then "Code of Federal Regulations."
- c. You can find a current list of technical standard orders on the FAA Internet website Regulatory and Guidance library at [www.airweb.faa.gov/rgl](http://www.airweb.faa.gov/rgl). You will also find the TSO Index of Articles at the same site.

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